A REVISION OF THE GENUS POLIOMINTHA (LABIATAE)

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Poliomintha (Labiatae) is a small North American genus whose four shrubby species inhabit the arid regions of the southwestern United States and northern Mexico. Bearing only two fertile stamens in combination with a tubular calyx, it is placed in the subtribe Melissinae, a heterogeneous group long recognized as taxonomically difficult. The two-stamen genera within the Melissinae, including *Poliomintha*, merge imperceptibly into one another and provide considerable difficulty in their definition. In addition, their morphological affinities with the four-stamen genera *Melissa* and *Satureja* open the question of unnaturalness within the subtribe and the taxonomic weight accorded stamen number. As pointed out by Epling & Stewart (1939) it is entirely possible that there has been extensive parallelism and convergence with the abortion of the upper stamen pair occurring repeatedly within the four-stamen groups. Indeed, one member of the Melissinae, *Pogogyne*, was revised to include both two- and four-stamen species (Howell, 1931).

The present study, which stems from preparations for the *Flora of Texas*, attempts to examine closely the generic status and relationships of *Poliomintha* as well as to bring needed insight into its morphology, distribution, and possibly phylogeny. It was originally hoped that the small number of species in the genus would permit breeding and chromosome studies. Unfortunately, repeated attempts at such studies over a number of years were successful with only one species, *P. longiflora*.

HISTORICAL ACCOUNT

The genus *Poliomintha* was created by Gray in 1870 to accommodate two species, *P. longiflora* and *P. incana*, the latter serving as the type. It should be noted, however, that informal recognition of the group came 11 years earlier with Torrey's description of *Hedeoma incanum* in 1859. Regarding the disposition of his new species, he stated, "It may remain in *Hedeoma* for the present, but, if other species like it should be found, it may be the type of a new genus." Between 1870 and 1890 three species were added (*P. bicolor*, *P. marifolia*, and *P. glabrescens*). In 1897, with Briquet's treatment of the Labiatae in *Die Natürlichen Pflanzenfamilien*, *Poliomintha* was merged with *Hedeoma*, reflecting the inherent difficulties in the disposition of the taxa. With the work of Epling & Stewart (1939), generic status was again given *Poliomintha*; in addition, the sections *Incanae* and *Saturejoides* were informally established. *Poliomintha conjunctrix* was added in 1940, bringing the genus to its current number of four species.

SIDA 5(1): 8—22. 1972.

CHROMOSOME STUDY

The chromosome numbers recorded to date from the subtribe Melissinae seem to reflect current concepts of monophyletic units; moreover, both number and morphology may be valuable criteria in segregating related genera (Irving, 1968). Unfortunately, only a few representative species of five of the 11 genera of Melissinae have been counted. The first count for *Poliomintha*, $2n = 36$, was made from aceto-carmine squashes of seed root-tips of *P. longiflora* Gray: MEXICO. NUEVO LEON. Calcareous hills near Monterrey, *Irving 698* (MONTU, TEX).

The number suggests a separation of *Poliomintha* from several possibly related groups. For example, the single species counted for *Hesperozygis*, *H. marifolia* ($2n = 44$; Irving, unpublished), has been extremely difficult to treat as it shows affinities to both *Poliomintha* and *Hedeoma*. The chromosome number $2n = 36$ for *Poliomintha* tentatively suggests a separation of *Poliomintha* and *H. marifolia*.

The chromosome numbers of the four-stamen genera *Melissa* and *Satureja* are diverse ($2n$ = 18, 20, 22, 30, 32, 42, 45, 48; Darlington & Wylie, 1955; Cave, 1965; Ornduff, 1967, 1968, 1969), but as yet $2n = 36$ species have not been encountered. Needless to say, additional chromosome numbers are needed for all these groups before conclusive relationships can be ascertained.

The chromosomes of *P. longiflora*, which average 3 microns in length, are large compared to those of *Hedeoma* or *Hesperozygis* (Irving, 1968). Moreover, they are primarily metacentric or submetacentric. With additional work these size and structural differences may prove useful in distinguishing and relating these taxa.

GENERIC LIMITS AND RELATIONSHIPS

On the basis of the present understanding of morphology, ecology, and distribution, *Poliomintha* is believed to be a natural group that is most likely monophyletic in origin. The question of its disposition remains. If it is argued that genera are to be recognized on the basis of clearcut and nonintergrading characters, then *Poliomintha* cannot be maintained as a distinct genus and should be merged with *Hedeoma*. With the application of this view, however, consistency in concept would demand that all 11 of the two-stamen genera of the Melissinae be brought together into one polymorphic genus. The distinctness of the characters used to separate *Poliomintha* from its closest ally, *Hedeoma*, are equal to those used to separate the remaining genera. This is approximately the rationale of Briquet (1897), who expanded *Hedeoma* to include most of these genera. This position, although logical, results in a taxon dissatisfying from several standpoints. Its resulting diversity of form would preclude meaningful generic characterization; indeed, there would remain but one character, the two stamens, to unify and distinguish the group. Equally important, such a taxon would severely obscure many evolutionary trends; quite likely the resulting genus would be partly horizontal in aspect, cutting across several

phyletic lines. Fortunately, however, it is well understood that the course of evolution does not permit application of *a priori* rules in the disposition of taxonomic rank. Each group must evolve its own generic and specific criteria. Thus, I have used the combination of subtle characters which do distinguish *Poliomintha* to accord it generic status.

Poliomintha is related to several sub-groups in the four-stamen genus *Satureja*, especially the shrubby section *Guardoquia*. The obvious difference between these groups is the number of stamens, but there are others. The canescent and shrubby habit and the symmetrical calyx can be found throughout the genus *Satureja*, but they occur together only in *Poliomintha*. The chromosome number of *Poliomintha*, when more completely known, may represent another possible difference.

Within the two-stamen groups, three genera need to be considered: *Zizophora*, *Hesperozygis*, and *Hedeoma*. For those seemingly more distantly related see Epling & Stewart (1939). *Zizophora* is a Mediterranean group whose morphological attributes are surprisingly similar to *Poliomintha*. One of the latter's most salient features is a radially symmetrical calyx whose subequal, deltoid teeth close the orifice at maturity. Another characteristic is its canescent pubescence. All three of these features are found consistently in *Zizophora*. The slight differences include the abortion of the lower anther sacs and the non-shrubby habit of *Zizophora*. The continental separation of *Poliomintha* and *Zizophora* is, however, a clear-cut difference. Unfortunately, the chromosome number(s) of *Zizophora* is unknown.

Poliomintha and the primarily South American genus *Hesperozygis* are relatively distinct except for the somewhat ambiguous species *H. marifolia* (2n = 44) of Mexico. The latter possesses the habit of *Poliomintha*, a calyx intermediate between the two genera, and the calyx annulus of more typical *Hesperozygis*. The differences between *Poliomintha* and the remainder of the genus *Hesperozygis* are tabulated below.

Hesperozygis	*Poliomintha*
Calyx either symmetrical and campanulate or bilabiate.	Calyx symmetrical, tubular.
Calyx teeth subequal, erect or disposed into upper and lower sets.	Calyx teeth subequal, inwardly reflexed to close the orifice.
Calyx annulus well defined and usually seated below the base of the teeth.	Calyx annulus absent or irregular and seated at the base of the teeth.
Corolla tube hirtellous.	Corolla tube annulate.
Principally South American.	Exclusively North American.
$2n = 44$ (one count).	$2n = 36$ (one count).

The genera *Hedeoma* and *Poliomintha* are quite close and nearly "connected" by several transitional species: *H. palmeri*, *H. molle*, and *H. montanum*. Although Epling & Stewart (1939) mention a few distinguishing

features, several more have been encountered which in combination separate the two genera. These are tabulated below.

Hedeoma	*Poliomintha*
Occasionally semishrubs, usually herbaceous perennials or annuals.	Shrubs.
Calyx tube gibbous or saccate.	Calyx tubular and symmetrical.
Calyx teeth usually acuminate and well differentiated into upper and lower sets.	Calyx teeth subequal, convergent to close the orifice.
Calyx annulus in a well-defined ring.	Calyx annulus absent or in an irregular ring.
Nutlets oblong or orbicular in outline, ca. 1.5 mm long or less, usually becoming mucilaginous when moistened.	Nutlets oblong, over 1.5 mm long, not becoming mucilaginous when moistened.
$2n = 34, 36, 44, 72, 144$.	$2n = 36$.

PHYLOGENETIC CONSIDERATIONS

To speculate on the intra- and inter-phyletic relationships of *Poliomintha* in the face of experimental ignorance is indeed tenuous. Yet as chromosomal morphology, populational dynamics, and other clues into evolutionary behavior are likely to remain undetermined for some time, the presentation of a tentative phyletic picture is, perhaps, not altogether out of place.

Poliomintha appears to represent an older phylad whose populations have experienced dissection and extinction with evolutionary time. Its shrubby habit, cylindrical, symmetrical calyx tube, undifferentiated calyx teeth, large corollas, and allogamous breeding behavior are all primitive features within the subtribe Melissinae as judged from the study of several other genera. Morphological transitions between taxa, often a salient feature of youthful and evolutionary active phylads, are conspicuously absent in *Poliomintha*. Although interpopulational variation occurs, the specific criteria remain intact. The complete allopatrism of its species also hints at long evolutionary divergence. By comparison, the species of the related genus *Hedeoma* are often annuals with highly zygomorphic calyces and cleistogamy. Its species frequently intergrade one into another, and as many as five species may grow sympatrically. In addition, the frequent occurrence of aneuploidy reinforces the more derived status of *Hedeoma*. (Irving, 1968.)

Poliomintha has diverged along two lines, representing the subgeneric groupings *Saturejoides* and *Poliomintha*. Yet the two lines display interesting parallelisms following their divergence. Both reveal identical shifts in inflorescence, corolla morphology, habitat, and distribution accompanying speciation from the "primitive" types.

Poliomintha longiflora (Saturejoides) ranges along the eastern periphery

of the Chihuahuan Desert from Monterrey southward to San Luis Potosí (Fig. 1). Its populations are found disjunctively on open exposed sites in the foothills flanking the Sierra Madre. It is most often associated with *Juniperus monticola* and *Agave lecheguilla* in an ecotone region between mesquite grassland and pine-oak forest. Morphologically it is well marked

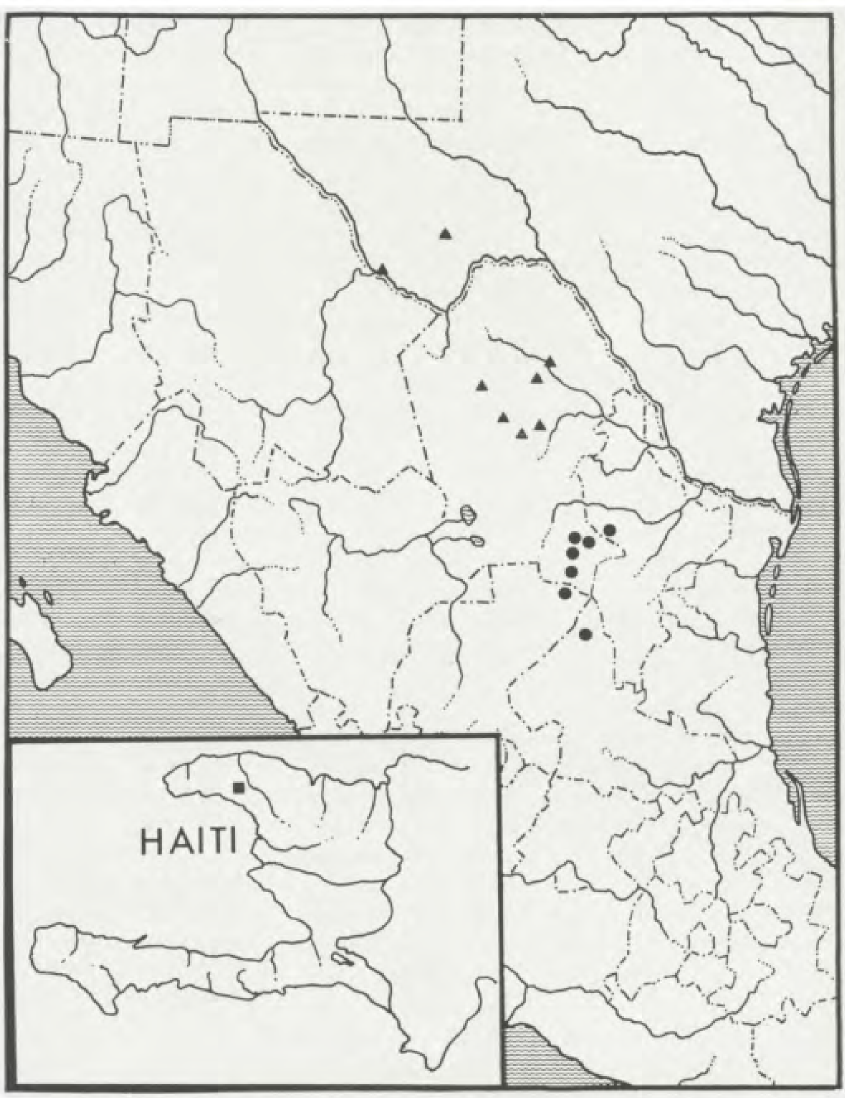


Fig. 1. Distribution of *Poliomintha longiflora* var. *longiflora* (circles), *P. longiflora* var. *congesta* (squares), and *P. glabrescens* (triangles).

by solitary flowers and large red corollas. The allied species *P. glabrescens* is found to the north of *P. longiflora* in the Chihuahuan Desert and in low xeric habitats. Although *P. glabrescens* is very similar to *P. longiflora* it possesses an inflorescence of 6-flowered cymes and bears small white corollas. *Poliomintha glabrescens* thus may be viewed as derived.

Section *Poliomintha* reveals a similar pattern with *P. conjunctrix* representing the relatively "primitive" mesophytic element. *Poliomintha conjunctrix* is known today only from a single population in the chaparral of northern Baja California (Fig. 2). It has a 3-flowered inflorescence with long red tubular corollas. In contrast, *P. incana* is a widespread, more northern species occupying extreme xerophytic sites in the lower Great Basin and western Chihuahuan Desert (Fig. 2). It possesses 6-flowered cymes and small white corollas.

By superimposing knowledge of the distribution, ecology, and morphology of *Poliomintha* on the presently known events of the Tertiary, a chronological evolutionary history can be formulated. Although this formulation is speculative, it provides the rationale for the existing relationships within the genus and hopefully the impetus for further study. As the events of the Tertiary have been reviewed in both botanical and geological literature they will not be reviewed here (Axelrod, 1950, 1958; Grant, 1959; Raven, 1962).

By the close of the Oligocene, a large xeric floristic element, the Madrotertiary flora, had developed between the tropical Neotertiary flora to the south and the temperate Arctotertiary flora to the north. As the primitive members of *Poliomintha* are today associated with the remnants of this flora, we can speculate that the Madrotertiary brought with it increased distribution and adaptive radiation in *Poliomintha*. Although it is possible that this period witnessed the origin of the group, it must be remembered that xeric sites, albeit limited in area, have been available to evolution since the Cretaceous (Axelrod, 1967). With the elevation of the western mountain axes in the Pliocene and early Pleistocene, increased aridity resulted in a dissection of the Madrotertiary flora into a number of isolated woodlands and widespread desert regions (Axelrod, 1950, 1958). Populations of *Poliomintha* perhaps at this time became contracted and fragmented with widespread extinction. However, with the development of true deserts, an evolutionary impetus was created to which *Poliomintha* responded, viz. *P. glabrescens* and *P. incana*. The role of the fluctuating environments of the Pleistocene is difficult to assess. Undoubtedly, there were distributional shifts and populational fragmentations.

SYSTEMATIC TREATMENT

POLIOMINTHA A. Gray, Proc. Am. Acad. 8:295. 1870.

HEDEOMA sect. POLIOMINTHA Briq. in Engler & Prantl, Nat. Pflanzenf. IV. 3a. 298, 1897.

Shrubs or semishrubs 1-3 m tall. Primary shoots numerous, narrowly

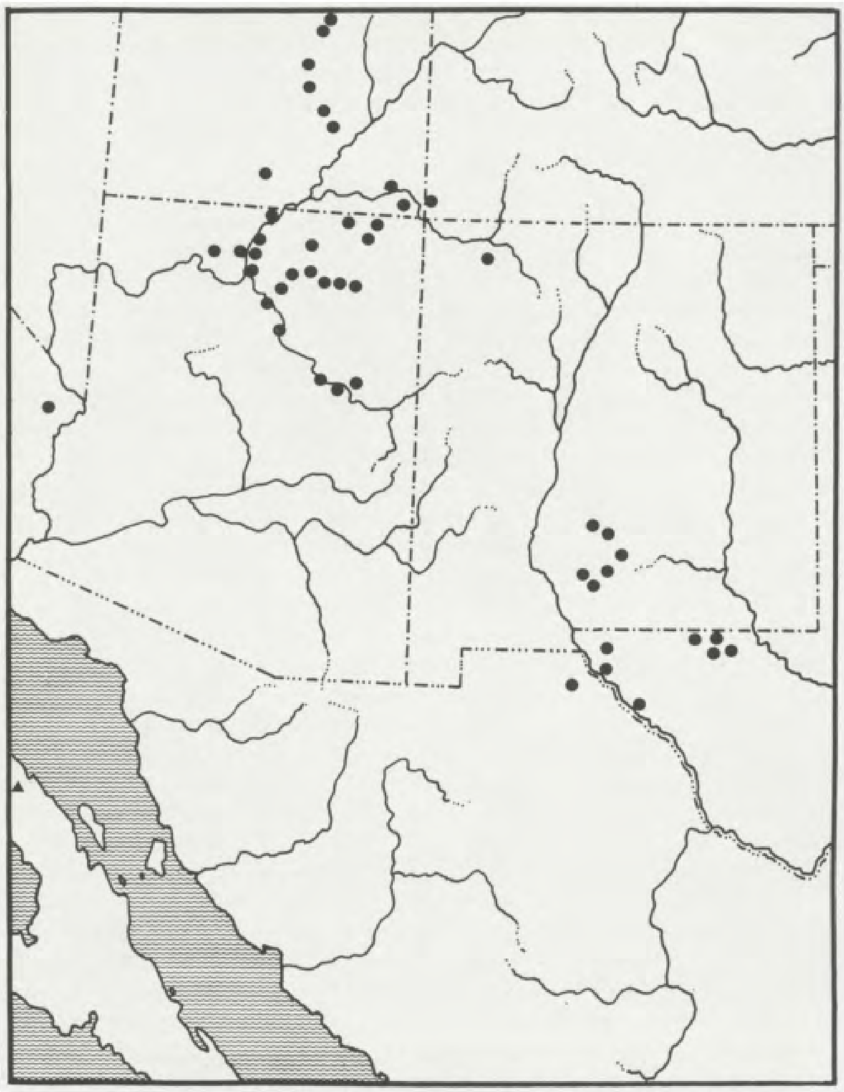


Fig. 2. Distribution of *Poliomintha conjunctrix* (triangles) and *P. incana* (circles).

or widely ascending, arising from a stout woody rootstock or caudex, puberulent, canescent, or tomentose with hairs spreading or antrorsely curling; branches slender and usually short, arising freely along the axes at wide or narrow angles. Leaves membranous, well spaced or crowded (internodes short), cernuous or spreading, linear, oblong, elliptical, ovate, or oval, 6-21 mm long, 1-6 mm wide, entire or serrulate, attenuated or

shortly petiolate, acute or obtuse; upper surfaces glabrate (*Saturejoides*) or tomentose (*Poliomintha*), lower surface strigillose or tomentose, hairs directed toward the apex; nervation inconspicuous, secondaries when prominent consisting of 2-3 alternating, straight pairs; both upper and lower surfaces uniformly glandular-punctate. Flowers solitary in the upper leaf axils or aggregated in 3—7-flowered cymes (cymules) in the upper 1/2-1/3 of the shoots; peduncles inconspicious or up to 3 mm long, pedicels 1-4 mm long, both peduncles and pedicels typically cinereous with retrorsely directed hairs; bracteoles (diminutive leaves subtending the pedicels) triangulate or subulate, shorter or longer than the pedicels. Calyx actinomorphic or nearly so, 4-12 mm long, 13—15-ribbed; the tube 3-9 mm long, cylindrical or pentagonal, the walls straight and not outwardly distended, cinereous or pilose, the antrorse or spreading hairs distributed uniformly or restricted to the ribs; calyx teeth 5, subequal or separable into an upper set of 3 and a lower of 2, variously pubescent on the inner face and convergent at some stage to close the calyx orifice; the upper teeth free or connate for 1/2 of their length, forming a small upper lip (*P. conjunctrix*), triangulate, 1-3 mm long, 0.5—1 mm wide, equal to or shorter than the lower teeth; lower teeth never connate, narrowly or broadly triangulate, 1-3 mm long, 0.5—1 mm wide at the base; pubescence within the tube either cinereous and restricted to the teeth faces (*Saturejoides*) or pilose and in an irregular ring or annulus seated at the base of the teeth (*Poliomintha*). Corolla strongly zygomorphic, with a pronounced tube (within the calyx) and throat (above the calyx), the limbs forming a conspicuous subgaleate upper lip and a 3-lobed spreading lower lip, lavender, orange-red or red, 10-35 mm long, pubescent on the outer surface with spreading hairs, densely pubescent within at the juncture of the tube and throat to form an annulus 2-4 mm wide; the tube 4-12 mm long; the throat 4-16 mm long, tubular, arching upwardly, dilating dorsiventrally, occasionally laterally distended (*P. incana*); the upper lip ligulate, emarginate, and straight, 3-7 mm long, 2.5—5 mm wide at the base; the lower lip spreading, the lobes equal or subequal, the central lobe again bilobed and exserted beyond the laterals, 3.5—8 mm long, 3.5—10 mm wide. Fertile stamens 2, seated on the abaxial surface and arched upwardly under the upper lip; filaments glabrous, anther sacs widely divergent on well-developed connectives, usually well exserted at anthesis; sterile stamens 2, reduced to subulate, glabrous filaments 1-2 mm long, seated at about the mid-point of the tube. The style long, exserted, its apex arching downwardly and unequally bifid, the lower division twice the length of the upper. Nutlets oblong in outline, oval or ovate in cross section, light to dark brown, 1-2 mm long, 0.5—1 mm wide, the surface smooth but glandular at the apex, not becoming mucilaginous when moistened. Chromosome number, $2n = 36$.

Distribution (Fig. 1 & 2): Northern Mexico and southwestern United States. Center of distribution appears to be in the northern Sierra Madre

Mountains of Mexico.

Type species: Poliomintha incana (Torr.) Gray

KEY TO THE TAXA OF POLIOMINTHA

1. Leaves and stems canescent to glabrate; leaves oval or elliptical; calyx 5-9 mm long, cinereous, 13-ribbed; calyx annulus absent (Sect. *Saturejoides*).
   2. Flowers solitary in the axils; corolla orange-red, ca. 25 mm long.
      3. Leaves typically elliptical and well spaced; calyx teeth clearly converging at maturity; plants of Mexico. . . . . 1a. *P. longiflora* var *longiflora*
      3. Leaves oval or rhombic, very crowded; calyx teeth slightly converging at maturity; plants of Haiti. . 1b *P. longiflora* var *congesta*
   2. Flowers in axillary, 6-flowered cymes; corolla white-lavender, ca. 15 mm long. . . . . 2. *P. glabrescens*
1. Leaves and stems tomentose; leaves linear-oblong; calyx 3-4 mm long, pilose, often 15-ribbed, calyx annulus present (Sect. *Poliomintha*).
   4. Corolla tubular, orange-red, ca. 25 mm long; endemic to Baja California . . . . 3. *P. conjunctrix*
   4. Corolla laterally inflated, lavender, up to 15 mm long; widespread throughout the southwest. . . . . 4. *P. incana*

POLIOMINTHA sect. **Saturejoides** Irving, sect nov. Frutices canescentes; folia ovalia vel elliptica; calyx 5.0-12.0 mm. longus, 13-costatus, annulo nullo. Type species *Poliomintha longiflora* Gray.

Canescent shrubs; leaves oval to elliptical; calyx 5-12 mm long, 13-ribbed, without an annulus.

1a. POLIOMINTHA LONGIFLORA Gray var. LONGIFLORA, Proc. Am. Acad. 8: 296. 1870. Holotype GH!: Mexico. COAHUILA. "Saltillo, mountains," 30 July 1848, *Gregg 313*. Isotype K!

Poliomintha bicolor Wats., Proc. Am. Acad. 25: 160. 1890. Holotype GH!: Mexico. NUEVO LEON. "Summit ledges, Sierra de la Silla," 5 June 1889, *Watson 2536*. Isotypes F!, NY!, PH!, UC!, US!

Hedeoma longiflorum (Gray) Briq. in Engler & Prantl, Nat. Pflanzenf. IV. 3a. 294, 1897. Based on *P. longiflora* Gray.

Hedeoma bicolor (Wats.) Briq., Ann. Conserv. Jard. Bot. Genève 2: 185. 1898. Based on *P. bicolor* Wats.

Poliomintha greggii Gray in Watson, Proc. Am. Acad. 25: 160. 1890 (nom. nud.).

Hedeoma greggii (Gray) Briq., Ann. Conserv. Jard. Bot. Genève 2: 185. 1898 (nom. nud.).

Robust shrubs or semi-shrubs 13-35 cm high. Shoots slender, ascending or somewhat decumbent, puberulent or glabrous below, pubescent or canescent above, hairs spreading, antrorsely curling, or appressed; branches slender,

brittle, and diverging at close angles. Leaves well spaced, spreading, or cernuous, oval to broadly or narrowly elliptical, 7-15 mm (11.3 mm) long, 2.5—6 mm (3.9 mm) wide, entire, attenuate and shortly petiolate, the petiole 1-2 mm long, apex obtuse, surfaces pubescent to tomentose below, glabrate above; nervation inconspicuous, the secondaries consisting of 2—3 alternate, straight pairs. Flowers solitary in the axils of the upper leaves, rarely in 2-flowered axillary cymes; peduncles prominent, 1.5—2 mm long; pedicels 1.5—4 mm long, cinereous with short antrorsely directed hairs; bracteoles lanceolate, exceeding the pedicels they subtend. Calyx 7-12 mm (9 mm) long, 13-ribbed; the tube 5.5—9 mm (6.9 mm) long, pentagonal, the sides straight and parallel below, becoming constricted above, evenly cinereous with appressed hairs; calyx teeth only scarcely differentiated into upper and lower sets, converging to close the orifice, densely and evenly pubescent within; the upper teeth very slightly connate (less than 1/2 their length), the lobes triangulate, 1.5—3 mm long, ca. 0.7 mm wide at the base; the lower teeth triangulate, 1.5—3 mm long, ca. 1 mm wide at the base; annulus absent, replaced by pubescence on the inner face of the teeth. Corolla orange-red, 27-35 mm (32 mm) long, pubescent within at the juncture of the tube and throat, the trichomes forming an annulus ca. 4 mm wide; the tube 7-12 mm long; the throat 15—16 mm long, expanded above, ca. 5 mm wide dorsiventrally; the upper lip broadly ligulate, emarginate, 5-7 mm long, 3.5—5 mm wide, straight (not upwardly reflexed), and flat (not concave); the lower lip 5-8 mm long, 6-10 mm wide, the lobes subequal with the central lobe slightly exserted beyond the laterals. Nutlets oblong in outline, ca. 2 mm long, 1 mm wide, the surface smooth but glandular distally. Chromosome number, $2n = 36$.

Distribution (Fig. 1). Open exposed sites in the foothills of the Sierra Madre Oriental and outlying ranges in Mexico; Monterrey, N.L., southwest to Catorce, S.L.P., 5,000-7,000 ft. June—September.

Despite the poor representation of *P. longiflora* in herbaria it is quite common throughout its range. On the somewhat inaccessible ridge tops and mesas where it is found it builds extensive populations. One of the most salient features of this species is its production of carvacol as the major constituent of its essential oil (Irving, unpublished). It is the same compound which gives the spice oregano (*Origanum* spp.) its distinctive odor and flavor. Because of this and the large size of its populations *P. longiflora* is collected in large quantities for sale locally or export to the United States as "Mexican oregano."

Representative specimens: MEXICO. COAHUILA: 6 mi SE of Saltillo, 21-23 Sep 1904, *Palmer 417* (GH, UC, US); 4 km E of Fraile, 11 Jul 1941, *Standford, Retherford & Northcraft 308* (DS, GH, UC); 3 mi SW of Saltillo, 3 Aug 1966, *Irving 703* (TEX); NUEVO LEON: Sierra de la Silla, 5 Jun 1889, *Pringle 2536* (F, GH, K, NY, PH, UC, US); SAN LUIS POTOSÍ: 12 km al W de Estacion Berrendo, municipio de Charcas, 11 Sep 1955, *Rzedowski 662* (GH, MICH, US); ca 30 mi W of Matehuala at Catorce, 1 Aug

1966, *Irving 695* (TEX); ZACATECAS: Aranzazu, 19 Jul 1934, *Pennell 17457* (MICH, PH); 2 mi above Maypil (W of conception del Oro), 2 Aug 1966, *Irving 698* (TEX).

1b. POLIOMINTHA LONGIFLORA Gray var. **congesta** Irving var. nov. Holotype MICH!: HAITI. Morne Vincent, M. des Commissaires, 14 Dec 1944, *Holdridge 2060*. Frutices glabrati; folia congesta, ovata, ovalia, vel rhombica, 6.0—9.5 (8.5) mm longa, 4.0—5.0 (4.7) mm lata, marginibus serrulata, basi decurrentia; calyx 9.0—10.0 mm longus, dentibus erectis; corolla rosea ca. 20.0 mm longa, annulata.

Robust shrubs up to 1 m in height. Shoots woody, ascending, with numerous short branches, glabrous and woody below, tomentose in the upper herbaceous stem regions. Leaves crowded, spreading, with margins becoming revolute on drying, ovate or rhombic, 6-9.5 mm (8.5 mm) long, 4-5 mm (4.7 mm) wide, serrulate, base attenuate, apex acute, petiole ca. 1 mm long, decurrent; both surfaces felty tomentose; nervation inconspicuous, the secondaries consisting of 2—3 subopposite, curved pairs. Flowers solitary in the uppermost leaf axils; peduncles ca. 0.7 mm long; pedicels ca. 3 mm long, cinereous; bracteoles linear-subulate, ca. 2.5 mm long. Calyx 9-10 mm long, 13-ribbed; the tube ca. 7 mm long, cylindrical but expanding upwardly, cinereous, the hairs antrorsely appressed, restricted to the nerves; calyx teeth slightly differentiated into upper and lower sets, pubescent on the inner face; the upper teeth connate for slightly less than 1/2 of their length, forming an upper lip, the lobes triangulate, ca. 1 mm long and 0.7 mm wide at the base, erect; lower teeth shorter than the upper, triangulate, ca. 1.5 mm long, ca. 0.5 mm wide at the base, erect or slightly converging with the upper; annulus absent. Corolla pink, ca. 20 mm long, densely pubescent in the tube, the trichomes forming an annulus ca. 7 mm wide; the tube ca. 9 mm long; the throat ca. 9 mm long, curved and expanded above, ca. 4 mm wide dorsiventrally; the upper lip broadly ligulate and cleft, ca. 2 mm long, 3 mm wide, straight and flat; the lower lip ca. 3 mm long, 5 mm wide. Nutlets not seen. Chromosome number, unknown.

Distribution (Fig. 2). Known only from the type locality. Details of its habitat are absent from the collection data.

2. POLIOMINTHA GLABRESCENS Gray, in Hemsl. Biol. Centr. Am. Bot. 2: 549. 1882. Holotype K!: MEXICO. COAHUILA. "Soledad, 25 mi SW of Monclova," Feb-Oct 1880, *Palmer 1056*. Isotypes F!, PH!, US!

*Hedeoma glabrescens (*Gray) Briq. in Engler & Prantl, Nat. Pflanzenf. IV. 3a. 294. 1897.

Semi-shrubs up to 50 cm tall. Shoots slender, sharply ascending, arising from a stout woody rootstock, puberulent throughout with minutely spreading hairs, occasionally densely so; branches brittle, slender, and diverging at close angles. Leaves cernuous, oblong to elliptical, 7-16 (12 mm) long, 3-4 mm (3.6 mm) wide, entire, subsessile, apex acute or obtuse; strigillose below, glabrate above; nervation inconspicuous, the secondaries consisting of 2—3 indistinct, alternate pairs. Flowers in 5—7-flowered axillary

cymules along the upper 1/2 of the shoots; peduncles conspicuous, ca. 1 mm long; pedicels ca. 1 mm long, canescent; bracteoles linear-lanceolate, longer than the pedicels they subtend. Calyx ca. 5 mm long, 13-ribbed; the tube 3.8 mm long, tubular or slightly pentagonal, evenly canescent with short appressed hairs; the calyx teeth scarcely differentiated into upper and lower sets, densely tomentose on their inner borders and apex, triangulate; the upper ca. 1.2 mm long, ca. 0.5 mm wide at the base; the lower ca. 1.2 mm long, and 0.7 mm wide at the base; all 5 teeth tightly convergent to close the calyx orifice; annulus absent. Corolla lavender, ca. 13 mm long, with a well-defined annulus at the juncture of the tube and throat, ca. 1.5 mm wide; the tube ca. 5 mm long; the throat ca. 5 mm long, dilated above, ca. 4 mm wide dorsiventrally; the upper lip ligulate, emarginate, ca. 4 mm long, ca. 3 mm wide, straight and somewhat concave; the lower lip ca. 4 mm long, ca. 5 mm wide, the lobes equal or subequal with the central lobe slightly exserted beyond the laterals. Nutlets oblong, ca. 1.5 mm long, ca. 0.7 mm wide, the surface smooth, glandular at the apex. Chromosome number, unknown.

Distribution (Fig. 1). Dry calcareous hills in the Chihuahuan Desert; Texas to Coahuila, Mexico. 4,000—6,000 ft. August—September.

Representative specimens: MEXICO. COAHUILA: Castanos, Puerta de San Lazaro, Sierra de San Lazaro, 30 Aug 1939, *Muller 3038* (GH, MICH, UC); Cuatro Cienegas, Sierra de la Madera, Canon del Aqua, 10 Sep 1939, *Muller 3255* (GH, MICH, UC); UNITED STATES. TEXAS: BREWSTER CO., McRae Canyon on Cox Ranch, 31 Jul 1953, *Warnock 11397* (LL); PRESIDIO CO., Solitario Peak area, 30 Jul 1957, *Warnock 15710* (NY, TEX).

POLIOMINTHA sect. POLIOMINTHA. Type species *Poliomintha incana* (Torr.) Gray. Tomentose shrubs; leaves linear-oblong; calyx 4.0—7.0 mm long, cinereous or villous, 13—15-ribbed, annulate.

3. POLIOMINTHA CONJUNCTRIX Epling & Wiggins, Contrib. Dudley Herb. 3:85. 1940. Holotype DS!: MEXICO. BAJA CALIFORNIA. "5 mi SE of Rancho San Antonio," Buenos Aires Plains, 20 Jun 1937, *George Lindsay, s.n.* (accession no. 259214). Isotype F!

Tall slender shrubs over 1 m in height. Shoots widely ascending, arising from a woody caudex, tomentose with a felty tomentum of retrorsely appressed hairs; branches short, brittle, diverging at wide angles. Leaves cinereous, cernuous, linear—oblong, 7-17 mm (13 mm) long, 2.5—3.5 mm (2.6 mm) wide, entire, attenuated and sessile, apex narrowly or broadly obtuse; surfaces tomentose, the lower densely so. Flowers in 3-flowered axillary cymules borne in the upper 1/3 of the shoots; peduncles 2-3 mm long; pedicels 1.5—2 mm long, tomentose with antrorsely appressed hairs; bracteoles subulate, shorter than the pedicels they subtend. Calyx 6-7 mm (6.5 mm) long, 13-ribbed; the tube 5.5—6.5 mm (6 mm) long, symmetrical and tubular, cinereous with short antrorsely curling hairs restricted to the nerves; calyx teeth subequal, slightly differentiated into upper and lower

sets, erect or slightly converging at maturity; the lower set slightly shorter than the upper, connate for ca. 1/2 its length, the lobes triangulate, 0.5 mm long and ca. 0.5 mm wide at the base; the upper teeth narrowly triangulate, ca. 1 mm long, ca. 0.7 mm wide at the base; annulus an irregular dense ring of long hairs (pilose) seated at the base of the teeth and extending upward onto the inner tooth faces, slightly exserted. Corolla orange-red, 20-21 mm long, densely pubescent at the juncture of the tube and throat, the trichomes forming an annulus ca. 3.5 mm wide; the tube 6-7 mm long; the throat ca. 11 mm long, expanded above, ca. 4 mm wide dorsiventrally; the upper lip ligulate, emarginate, ca. 7 mm long and 3 mm wide; the lower lip ca. 5 mm long, ca. 5 mm wide, the lobes subequal. Nutlets tan, oblong in outline, ca. 2 mm long, ca. 1 mm wide, the surface smooth or weakly areolate, glandular at the apex. Chromosome number, unknown.

Distribution (Fig. 2). Known only from the type locality.

4. POLIOMINTHA INCANA (Torr.) Gray, Proc. Am. Acad. 8: 296. 1870. Holotype NY!: TEXAS. EL PASO CO., "near El Paso," *Parry, Wright, Bigelow* (*Wright 1523*). Isotypes, GH!, K!, PH!, US!

Hedeoma incanum Torr., U.S. Mex. Bound. Surv. 130. 1859.

Robust canescent shrubs to 3 m high. Shoots slender, ascending, bearing gray-fissured bark below, tomentose with short, retrorsely appressed hairs above; branches slender and arising at close angles. Leaves gray-green, spreading or cernuous, linear-oblong or occasionally obovate below, 11-21 mm (15 mm) long, 1.3—3 mm (2.1 mm) wide, entire, attenuated and sessile, apex acute or obtuse; surfaces equally tomentose or tomentulose; nervation indistinct. Flowers typically in 3-flowered axillary cymules borne in the upper 1/2 of the shoots; peduncles ca. 1 mm long; pedicels ca. 1.1 mm long, tomentose; bracteoles linear, longer than the pedicels they subtend. Calyx 4-5 mm long, 13—15-ribbed; the tube 3-4 mm long, cylindrical, the sides parallel, moderately to densely pilose with hairs up to 2 mm long, strigose beneath the pilose coat; calyx teeth subequal, only scarcely differentiated into upper and lower sets, lower slightly longer than upper, narrowly triangulate, 1-2 mm long, ca. 1 mm wide at the base; teeth converging to close the calyx orifice; annulus an unequal dense ring of exserted long hairs (pilose) situated at the base of the teeth. Corolla lavender, 10-14 mm long, pubescent at the base of the tube and throat, the trichomes forming an annulus; the tube 8-9 mm long; the throat both laterally and dorsiventrally inflated (3-5 mm wide laterally and dorsiventrally); the upper lip ligulate, emarginate, 3.5—4 mm long, ca. 2.5 mm wide, straight and slightly concave; the lower lip ca. 3.5 mm long, 3.5—4 mm wide, the lobes unequal, the central lobe bilobed and exserted beyond the laterals. Nutlets oblong, ca. 2 mm long, ca. 1 mm wide, the surface smooth and glandular. Chromosome number, unknown.

Distribution (Fig. 2). Sand hills frequently of gypsum origin; Mexico,

Texas, New Mexico, Arizona, Utah, Colorado, and California. 2,000—4,000 ft. April—October.

Poliomintha incana is the most widespread member of the genus, although disjunctively so, and forms extensive populations where it occurs. It is apparently well adapted to the dune-sand habitat and is able to withstand repeated burial.

Representative specimens: MEXICO. CHIHUAHUA: near El Paso del Norte, 9 Apr 1885, *Pringle 275* (F, GH, PH, POM, US); Samalayuca, 28 Jan 1903, *Coville 1700* (US); 5 mi S of Samalayuca, 19 Apr 1960, *Cruchfield & Johnston 5265* (MICH, TEX); UNITED STATES. ARIZONA: APACHE CO., Holbrook, 20 Aug 1883, *Rusby 784* (MICH, PH, UC, US); COCONINO CO., 10 mi W of Navajo Bridge, 24 May 1939, *Barkley & Reed 4370* (DS, PH, POM, UC); NAVAJO CO., Monument Valley, 14 Sep 1938, *Eastwood & Howell 6656* (CAS, US); CALIFORNIA: SAN BERNARDINO CO., Cushenbury Springs, 12 Jul 1938, *Jaeger s.n.* (POM); COLORADO: MONTEZUMA CO., E of Aneth, Utah, 19 Jun 1968, *H. D. Harrington 10107* (CS); NEW MEXICO: DONA ANA CO., White Sands, 19 Jun 1899, *Wooton s.n.* (DS, MICH, NMC, POM, TEX, UC, US); OTERO CO., 13 mi W of Tularosa, 5 Jun 1938, *Cutler 2016* (CAS, GH, UC); SAN JUAN CO., S of Bloomfield, 5 Jul 1929, *Mathias 615* (GH, POM); TEXAS: CULBERSON CO., 29 mi W of Orla, 11 Jul 1965, *Irving 613* (MONTU, TEX); EL PASO CO., 2 mi NE of Fabens, 5 Jul 1958, *Correll & Johnston 19276* (LL); HUDSPETH CO., 3 mi E of McNary, 18 Apr 1930, *Cory 3445* (POM); UTAH: EMERY CO., 20 mi SW of Greenriver, 3 Jun 1953, *McVaugh 14421* (CAS, MICH, TEX); GARFIELD CO., 16 mi N of Hite & 35 mi S of Hanksville, 17 May 1961, *Cronquist 9055* (DS, MICH, TEX, UC); GRAND CO., ca 1 mi N of Moab, 20 May 1957, *Vickery, Jr. 801* (DS, GH, UC); SAN JUAN CO., 5 mi N of Mexican Hat, 24 Jul 1939, *Cutler 2779* (DS, GH); WAYNE CO., 15 mi S of Hanksville, 16 May 1950, *Harrison 11532* (UC).

EXCLUDED NAMES

Poliomintha marifolia (Briq.) Gray, Proc. Am. Acad. 8: 365. 1872. = *Hesperozygis marifolia* (Briq.) Epling in Rep. Spec. Nov. Beiheft 115: 13. 1939.

Poliomintha mollis (Torr.) Gray, Proc. Am. Acad. 8: 365. 1872. = *Hedeoma molle* Torr. in Bot. U.S. & Mex. Boundary Surv. 2(1): 129. 1859.

ACKNOWLEDGEMENTS

Acknowledgement is made to all persons responsible for the loan of specimens. Abbreviations of herbaria from which specimens were borrowed are those standardized by Lanjouw & Stafleu (1964). Thanks are also given to Drs. D. Bilderback and C. Miller for their help with the manuscript.

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